Larvicidal effects of *Bacillus thuringiensis* and azadirachtin on Senegalese (West Africa) populations of *Crocidolomia pavonana* (Fabricius) (Lepidoptera: Crambidae) under laboratory conditions

SARR, Jean Marie Latyr [2]; SALL-SY, Diénaba [1]; COLY, Emile Victor [1]; KANE, Aboubacry [2] & PFEIFFER, Douglas [3]
[1].ISRA/CDH, Senegal [2] Dept. of Plant biology FST/UCAD, [3]:Entomology, Virginia Tech;

Introduction

Cabbage head caterpillar (Fig.1) *Crocidolomia pavonana* (Lepidoptera) is damaging insect pest of a number of important brassica crops in Senegal (Collingwood et al., 1984) and over the world including cabbage, kale, rape (Fig. 2), sometimes causing more than 70% crop losses. Organophosphorous insecticides are the main tactic to fight insect pests. About 75% of growers use these products in brassica crops in areas surrounding Dakar (Sall-Sy, 2005). Rarely, bacterial or neem based biopesticides are used on cabbage, a popular vegetable to grow and to eat in the urban and peri-urban areas of Senegal particularly in Niayes areas around Dakar, Thies, Louga and Saint-Louis

Fig. 1. *Crocidolomia pavonana* gragarious larvae on cabbage leaf

Fig. 2. *Crocidolomia pavonana* injury to cabbage head.

Production of cabbages for the peri-urban market takes about 8% and range by 4th position among vegetables production (Ndoye-Niane, 2010) In 2009, 40 000 tons of cabbage was produced .

Objectives

Research was conducted in the laboratory in 2010 with Dakar -Niaye area *Crocidolomia pavonana* populations, to address the following questions:

• Are Senegalese *Crocidolomia* susceptible to Bt and neem extracts?

• Which is more effective against larvae?

• What happens if the products are mixed, a common grower practice?

Materials & methods

A colony of the insect was established at the entomology laboratory of Dakar Horticultural Crop Development Center (CDH). The larvae had no contacts with B.t. toxins or neem extracts in rearing facilities and they were reared on one month old cabbage leaves at 28°C, and 70% RH. 240 3rd instar larvae were used for bioassays using leaf dip disc bioessays method (Liu et Tabashnik, 1996). Treatments were made following collection of biological data. Four different solutions based on concentrations and doses were used : T0 (control), T1 (*Bacillus thuringiensis*), T2 (azadirachtin) and T3 (*Bacillus thuringiensis* + azadirachtin)

Substance active	*Bacillus thuringiensis*	Azadirachtin
Concentration	16000 IU/ mg	10g/l
Formulation	Wettable Powder	Emulsifiable Concentre
Dose	1g/l	13.3ml/l

Statistical analysis was done with CoSTAT software. ANOVA comparing traitements and the Student-Newman-Keuls test to 5% probability determined the significance level of mortality means. The mortality of the larvae in both the neem oil formulation and *Bt* were corrected using Abbott's formula, each with the data gained from the negative control

Results

❖Biology

❑ **Stages of *Crocidolomia pavonana***

Egg plate **Larva** **Pupa** **Adult female** **Adult male**

The incubation period was estimated from four to five days and the hatching rate from 43, 2 to 100 % at 28°C - 30°C. Five larval stages were recorded with a rate of survival which varied from 10, 8 to 68 % and duration from 8 to 12 days. 16, 6 to 50 % of adults emerged from pupae after 8 to 13 days.
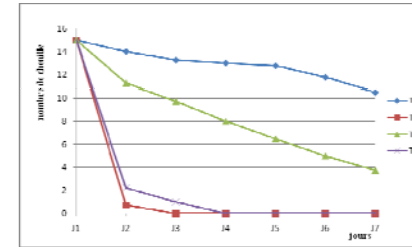
Stages	Eggs	L1	L2	L3	L4	L5	Prepupa	Pupa
Duration (days)	4-5	2	1-2	2-3	1	2-3	1	8-13

❑Rates of egg hatching and imago emergence

Rates	Egg hatching (%)	Larval survival (%)	Adult Emergence (%)
Mean	73	25	35
intervals	43,2 - 100	10,8 - 68	16,6 - 50

❖Progression of larval mortality

Number of larvae

Jours: days

T0 (control), T1 (*Bacillus thuringiensis*), T2 (azadirachtine) and T3 (*Bacillus thuringiensis* + azadirachtine)

The mortality evaluation showed that the *Bacillus thuringiensis* and the association *Bacillus thuringiensis* + azadirachtine were more effective than the azadirachtine. In 7 days, they killed repectively 100 % and 75 % of caterpillars.

Analyse of variance of larval mortality

Source	df	SS	MS	F	P
Blocks	3	3.1875	1.0625	2.0958904	.1711 ns
Main Effects					
Treatment	3	294.1875	98.0625	193.43836	.0000 ***
Error	9	4.5625	0.5069444<-		
Total	15	301.9375			

Coefficient of Variation = 6.22%

The difference is non significant between blocks and highly significant between Treatments. This was confirmed by the LSD test

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Acknowledgments